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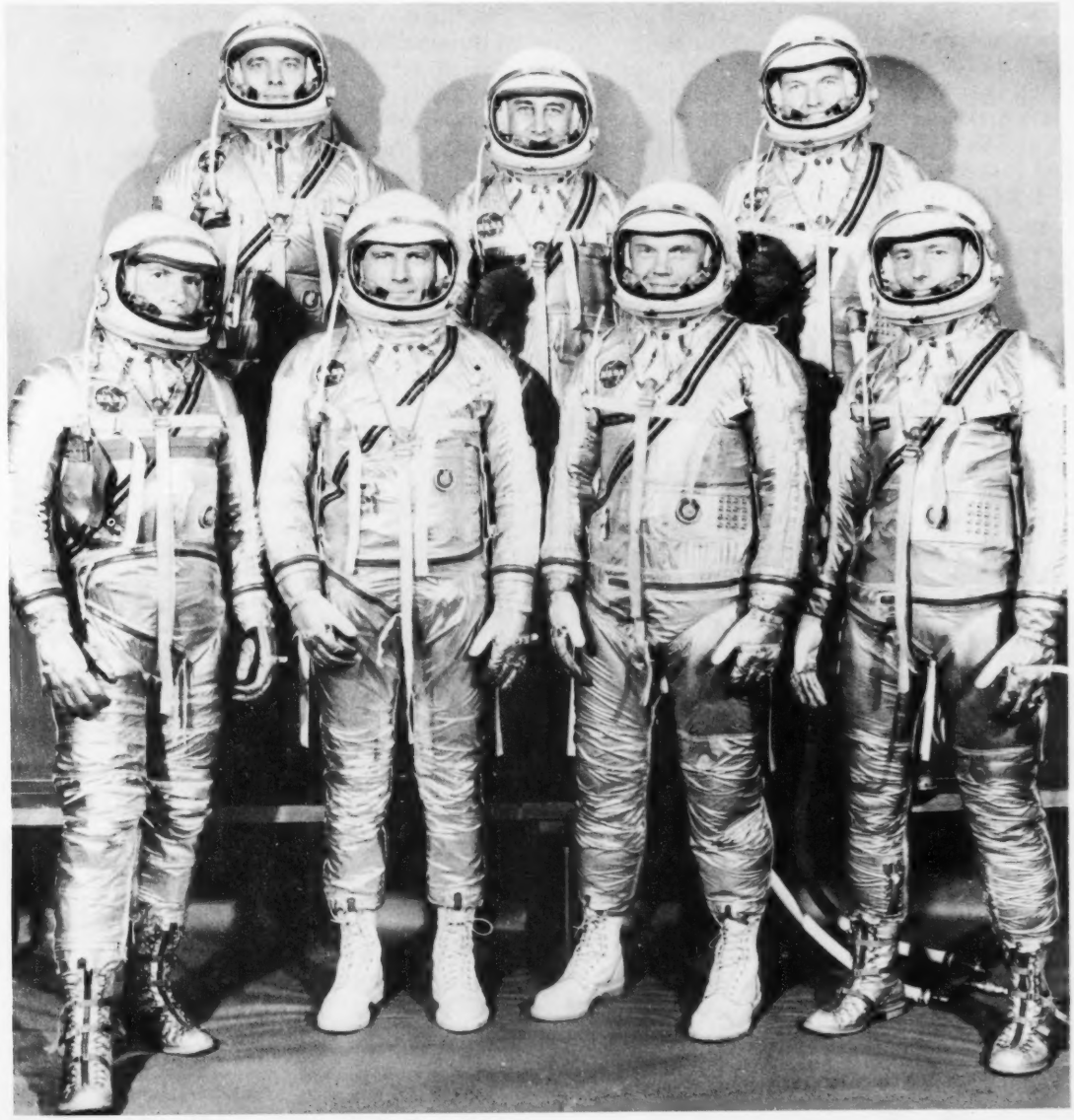

About the Cover

On April 9, 1959, NASA announced the selection of seven men chosen to be the first U.S. space travelers or "astronauts." The term followed the semantic tradition begun with "argonauts," the legendary Greeks who traveled far and wide in search of the Golden Fleece, and continued with "aeronauts," pioneers of balloon flight. Robert R. Gilruth, head of the NASA Space Task Group, proposed the name "Project Astronaut" for this first manned space effort. But his suggestion lost out in favor of the name Project Mercury largely because it was felt his suggestion "might lead to overemphasis on the personality of the man."

On the cover are the Mercury astronauts. Front row, left to right; Walter M. Schirra, Jr.; Donald K. Slayton; John H. Glenn, Jr.; Scott Carpenter. Back row, left to right; Alan B. Shepard, Jr., Virgil I. "Gus" Grissom, and L. Gordon Cooper.

In Project Mercury, the United States acquired its first experience in conducting manned space missions and its first scientific and engineering knowledge of man in space. Six flights comprised the Mercury program: Mercury Redstone 3, May 5, 1961 (suborbital flight); Mercury Redstone 4, July 21, 1961 (suborbital flight); Mercury Atlas 6, Feb. 20, 1962 (3 orbits; John Glenn was the first American to orbit the Earth during this flight); Mercury Atlas 7, May 24, 1962 (3 orbits); Mercury Atlas 8, Oct. 3, 1962 (6 orbits); and Mercury Atlas 9, May 15-16, 1963 (22 orbits, the first full-day mission in space).

Each of Project Mercury's astronauts chose a call sign for his spacecraft just before his mission. Alan B. Shepard, Jr., selected "Freedom 7" for his flight on May 5, 1961 and established the tradition of using the numeral 7 which came to be associated with NASA's first team of astronauts. Virgil I. Grissom chose "Liberty Bell 7" as the spacecraft name for his flight on July 21, 1961; John H. Glenn, Jr., "Friendship 7" for his flight on Feb. 20, 1962; Scott Carpenter, "Aurora 7" for his flight on May 24, 1962; Walter M. Schirra, "Sigma 7" for his flight on Oct. 3, 1962; and L. Gordon Cooper, "Faith 7" for his flight on May 15-16, 1963.

Contents

Search for Extraterrestrial Intelligence 3
Images from IRAS Reveal Data Not Visible from Earth 5
International Rocket Experiments Held in Peru 6
Space Telescope History Project Begun 7
1983 Air and Space Bicentennial Calendar of Events 8
NASA's 25th Anniversary Historical Calendar of Events for April 9
NASA Sets Up Small Business Research Office ... 9
New Research Program to Study Ways to Reduce Helicopter Noise 10
Viking Exhibit Opens at National Air and Space Museum 11
Most Distant Object in Universe Discovered 12
NASA's Handicapped Program 14
Awards Corner 14
What's New in NASA's Television and Radio Programming 15
Contractor News 16
Space Shuttle Launches for 1983 18
Patents for Inventions 19
Expendable Launches for 1983 19
Another Dividend from Air and Space 20

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Search for Extraterrestrial Intelligence

Does intelligent life exist elsewhere in the universe? That question long has interested philosophers and scientists and for many decades has stimulated intriguing space science fiction as well as a search for relevant science fact. However, the first serious scientific attempt to search for extraterrestrial intelligence (SETI) is of relatively recent origin, an outgrowth of space age advances in science and technology.

Named Project Ozma, it began in Virginia in 1960 at the National Radio Astronomy Observatory (NRAO) under the direction of Dr. Frank Drake, astronomer now at Cornell. Using the Observatory's radiotelescope, Dr. Frank and his associates listened, without success, for artificial radio signals from space. Since then other attempts have been made at NRAO and at the National Astronomy Ionospheric Center at Arecibo, Puerto Rico, where the world's largest radiotelescope is located. A number of other nations, among them the Soviet Union, have taken steps toward SETI programs, opening opportunities for international collaboration.

Programs for SETI have attracted the efforts of able and imaginative individuals who have made use of existing radio systems and instrumentation, some with ingenious modifications. The pioneer research in SETI has been minimal in time and cost. For example, the time spent in SETI at NRAO in 1960, according to Dr. David S. Heeschen, NRAO Director, was not more than one percent of the total time spent in other scientific observations there. Since 1960, the time spent in SETI at NRAO is less than 0.1 percent per year.

The results of SETI, to date, have been negative. Is a continued effort, therefore, worthwhile? It is, according to many of the world's leading scientists, who believe the effort itself has been valuable. SETI has stimulated thought and discussion and has generated ideas for further exploration and instrumentation. The members of the Astronomy Survey Committee of the National Research Council of the National Academy of Sciences recommended for the 1980s "an astronomical Search for Extraterrestrial Intelligence (SETI), supported at a modest level, undertaken as a long-term effort . . . and open to the participation of the general scientific community." In its report, the Committee also stated, "Modest support of such programs by U.S. funding agencies is a legitimate scientific activity . . ."

In 1979, NASA proposed a long-term program for SETI as a small part of its larger ongoing effort to explore life forms on Earth and in the universe, and to study extraterrestrial environments that are host to the

NASA's Goldstone Tracking Station near Barstow, Calif. This 185-foot Venus dish, part of NASA's Deep Space Network, is to be used in the agency's Search for Extraterrestrial Intelligence effort to communicate with interplanetary spacecraft.

chemical precursors of life as we know it. The current proposed funding of NASA's SETI is modest, amounting to a little over a million dollars annually over a seven-year period, an investment of about 5 cents per person for the entire seven years.

The objectives of NASA's SETI program are to listen for extraterrestrial microwave signals (signals similar to man-made radio signals) transmitted by some extraterrestrial intelligence; accomplish radio-astronomy mapping of a major portion of the sky; and conduct studies of man-made radio frequency interference for future use in data acquisition, tracking and communication projects.

SETI in NASA is a joint effort of NASA's Ames Research Center, Mountain View, Calif., and the Jet Propulsion Laboratory in Pasadena. Ames is responsible for the science and program management; JPL has the task of developing and operating instrument systems to meet NASA program objectives. John Billingham at Ames is SETI program manager. Allan Burman, JPL, leads the operations team. Project scientists are Dr. Samuel Galkis of JPL and Dr. John Wolfe of Ames.

NASA plans to conduct an all-sky survey, with close attention to and observation of specific locations that appear promising. Instrument responsibilities by JPL includes design and development of a supercooled amplifier with a radio frequency bandwidth 10,000 times broader than the radio frequency range of an AM radio, and compatible receivers. This will provide unprecedented tuning capability and sensitivity.

Spectrum analyzers will be constructed capable of splitting the broadband signal into as many as 8 million to 16 million discrete channels. A prototype under construction will provide 60,000 channels and will be used to prove the design concepts before building larger devices. The instrument will be used to search out signals of extraterrestrial origin while simultaneously gathering information on radio astronomy by means of sophisticated computer techniques for processing signals. Information will be handled on a real-time basis; and stored data will be kept to a minimum. The instrument will be able to operate unattended.

Instruments now available that can be used for SETI are the antennas of the Deep Space Network at Goldstone, Calif., at Canberra, Australia; at the radio astronomy facility at Arecibo; and other radio astronomy observatories.

While NASA scientists in SETI will be listening for artificial radio signals, they also will be looking for stars similar to our Sun. The more widely accepted theory of how stars are formed suggests that planets are normal and frequent companions of most stars. The theory is that interstellar clouds and dust collapse to form stars, leaving clumps of material that coalesce into planets.

The Milky Way galaxy alone has between 200 million and 100 billion stars; and it appears statistically probable that among those stars are some like our Sun with planets having an environment in which life forms have evolved with intelligence able to build instruments for interstellar transmission and reception and with the curiosity to search for life elsewhere.

Thus far such signals have not been detected by Earth-based radio astronomy receivers. But until now only very narrow regions of the spectrum have been explored for artificial signals. Considering the lack of knowledge we have, an all-sky survey, combined with intensive observation at nearby stars, seems appropriate. SETI scientists believe that in the absence of knowledge of any intelligence but that which we know here on Earth, our own, it is wise to make as few assumptions as possible. However, there is speculation as to where to search and at what frequency.

One region that offers promise lies in the broadcast frequency between the natural radiation of hydrogen (H) and the radical hydroxyl (OH) called "the waterhole." This region is attractive because of the important role water plays in Earth life and because it is a region of relative radio quiet where artificial signals should be fairly easy to detect. But the waterhole is a very tiny fraction of the available electromagnetic spectrum.

"We are in an era," as the National Research Councils' report on Astronomy and Astrophysics for the 1980s states, "when it is technically possible both to detect planets around nearby stars and to detect signals from intelligent life on planets immensely farther away, even if we cannot detect the more distant planets themselves."

We have been transmitting radio waves only for about 50 years and only in the past 30 years at short wavelengths and with sufficient power to be detected by intelligence, if it exists, on planets surrounding nearby stars.

In testimony before the House Subcommittee on Space Science and Applications meeting to discuss extraterrestrial intelligence research, Dr. Bernard M. Oliver of the Hewlett-Packard Corporation observed that, "In 15 billion years, a small part of the universe (our Earth) now contemplates the whole of it . . . We know of nothing unique about Earth that might have restricted life to this planet. Indeed . . . there may be as many as 10 billion 'good' Earths circling 'good' Suns in our galaxy."

With this in mind, if we are not alone, the search offers hope for discovery; and that is the distant promise of SETI.

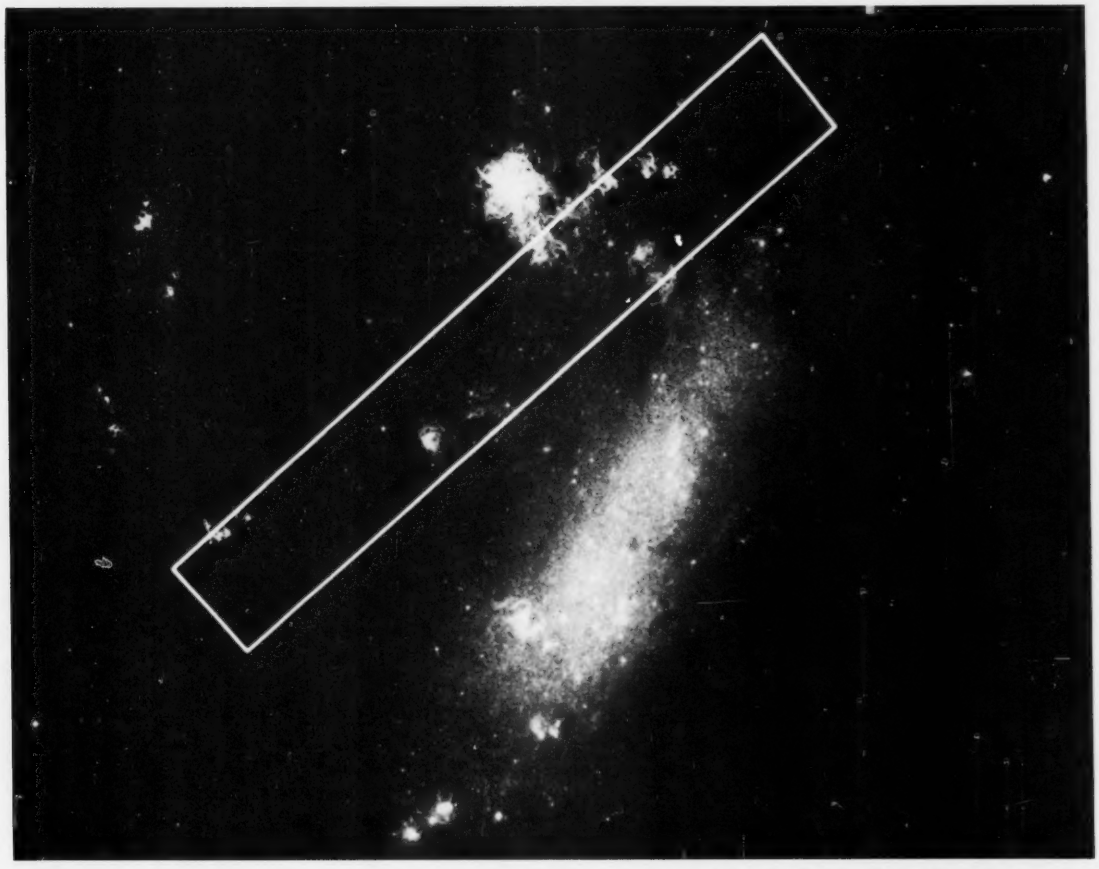
Images from IRAS Reveal Data Not Visible from Earth

Data images from the Infrared Astronomical Satellite have revealed a nebula that may contain a star thousands of times more massive than the Sun. Launched Jan. 25 by NASA, IRAS will scan the universe for 7 to 9 months to produce the first all-sky survey. Data from IRAS is expected to revolutionize astronomical knowledge by providing scientific data about infrared sources in the universe.

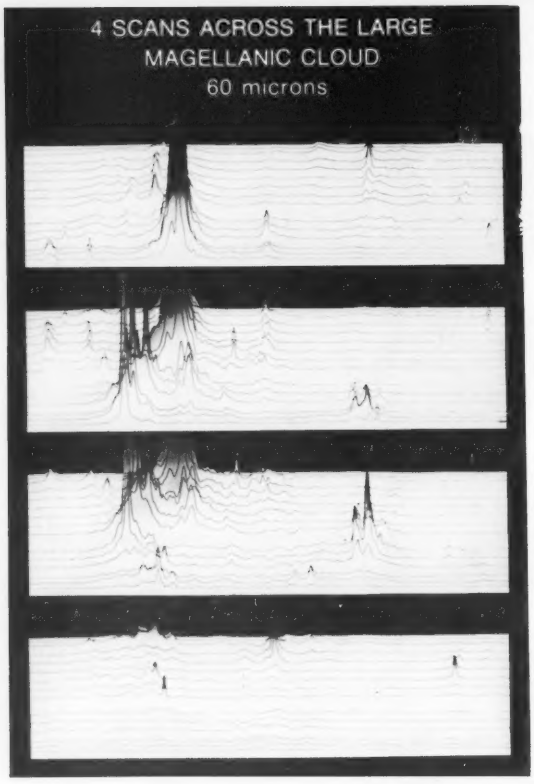
IRAS has scanned part of the galaxy called the Large Magellanic Cloud, located 155,000 light years from Earth—our planet's closest galaxy—and revealed dozens of infrared sources, stars, and regions of dust and gas in the Cloud not visible to Earth-based optical telescopes. Infrared obsevations from Earth are limited as the atmospnere blocks all frequencies of infrared. Some of the sources revealed by IRAS may be new stars forming behind clouds of dust and gas that radiate the star's energy in the infrared.

Within a nebula in the Large Magellanic Cloud called 30 Doradus, IRAS revealed an image of a cloud nicknamed the Tarantula by astronomers because the cloud's long, separated filaments gave it a spider-like appearance. The image is translated in false-color with white as the brightest detector reading and blue the faintest.

The 30 Doradus nebula is a giant H II region in the Large Magellanic Cloud. H II regions are clouds of hydrogen that have been ionized by the ultraviolet radiation from a very hot star. Giant H II regions such as 30 Doradus are powerful emitters of far infrared radiation. Some astronomers have suggested that this nebula contains a monster star, thousands of times more massive than the Sun.



Rectangular outline shows a region scanned by the Infrared Astronomical Satellite across the galaxy called the Large Magellanic Cloud, located 155,000 light years from Earth. The bright object just outside the marked area at left is part of the nebula 30 Doradus.



Data charts from four overlapping scans made by IRAS across the galaxy called the Large Magellanic Cloud, the nearest galaxy to Earth. Each IRAS scan shows how the strength of the signals seen by satellite's fifteen 60-microns-wavelength detectors changes with time as the telescope tracks across the sky. Each of the four frames shows a 75-second stretch of observations, made on different orbits during the first day after the telescope cover was ejected on Jan. 30. IRAS scanned a swath of the sky half a degree wide and five degrees long. Very intense and complex emission is seen from the vicinity of the Tarantula nebula, shown left of center in the upper three scans. Some astronomers have suggested that this nebula contains a monster star, thousands of times more massive than the Sun.

IRAS is a joint international mission linking the United States, the Netherlands and the United Kingdom. The United States produced the ultra-sensitive telescope, the Netherlands provided the basic spacecraft to carry the telescope and the United Kingdom operates the IRAS tracking station at the Rutherford Appleton Laboratory at Chilton.

The telescope's sensitivity is produced by the use of liquid helium in the satellite to cool the infrared detectors to 2 degrees above absolute zero. This allows them to register the faintest impulse of infrared from objects in space.

International Rocket Experiments Held In Peru

An international team of scientists have conducted a month-long program of sounding rocket launches in Peru to study the upper tropical atmosphere. The program, called Project Condor, is an equatorial atmospheric rocket/radar campaign of universities and aerospace agencies from the United States, Peru, The Federal Republic of Germany and France. NASA provided the rockets, scientific payloads and the equipment for tracking the rockets and receiving data transmitted from them.

The purpose of the rocket experiments was to map electrical conditions and the wind and radio wave patterns found in the upper atmosphere in the tropics. The tropical atmosphere is of interest in part because the magnetic equator (located in Peru) is the portion of the planet where the magnetic field is perfectly horizontal while gravity points directly downward.

The rockets were launched from the Punta Lobos Launch Range, a distant point on Peru's desert coast about 60 kilometers (37 miles) south of Lima. The Jiacamarca Radio Observatory, east of Lima, provided ground-based information and measurements from the sounding rockets.

Launch window for the program opened Feb. 26 and ran through the end of March. Of the 29 rocket launches, 19 were sent aloft in one 24-hour period on March 7. In addition, two of the rockets, scheduled for pre-dawn launches on March 12, released colorful chemical clouds that were visible as far away as Arequipa, 850 km (528 mi.) to the south, and Chiclayo 650 km (404 mi.) to the north. The clouds, formed by releasing barium and strontium at altitudes of 555 km (345 mi.) and 425 km (264 mi.), first appeared as small white balls and then expanded in size and changed in color to greenish blue.

The launches varied in size from the relatively small Super Loki, measuring 31 kilograms (68 pounds) in weight, 3.3 meters (131 inches) long, and 10 centimeters (4 inches) in diameter, to the larger Terrier Malemute, measuring 1,067 kg (3,543 lb.) in weight, 12 m (39 ft.) long, and 46 cm (18 in.) in diameter. The payloads carried by these rockets varied from the 2.7 kg (6 lb.) Super Loki payload to the Taurus Orion payload weight of 156 kg (343 lb.) carried by the Terrier Malemute.

Cooperating in Project Condor was NASA, the National Science Foundation, the Commission Nacional de Investiacion Y Desarrollo Aeroespacial (CONIDA),

Sounding rockets prepared for launch from the Peruvian Punta Lobos Launch Range for Project Condor, a month-long project designed to study the upper tropical atmosphere.

and the Instituto Geofisico del Peru. In addition, scientists, engineers and other specialists from a number of universities took part in the project. The universities represented included the University of Alaska; University of California at San Diego; Cornell University; University of Denver; University of Illinois; Max Planck Institute, West Germany; Pennsylvania State University; University of Toulon, France; and Utah State University.

CONIDA provided the range and range support. The Instituto Geofisico del Peru provided ground-based atmospheric measurements and support from Jiacamarca Radio Observatory and the Hunacayo Observatory, approximately 200 km (125 mi.) east of Lima.

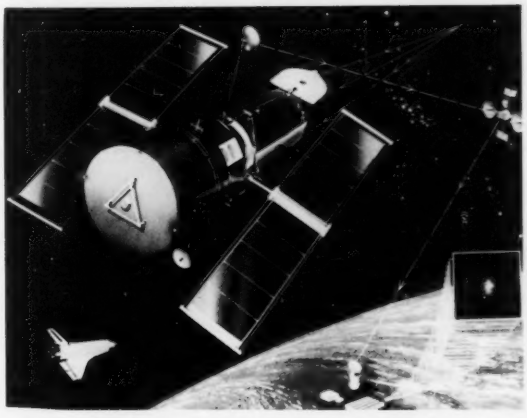
Project Condor is part of the NASA Sounding Rocket Program and is managed for NASA by the Goddard Space Flight Center, Wallops Flight Facility, Wallops Island, Va.

Space Telescope History Project Begun

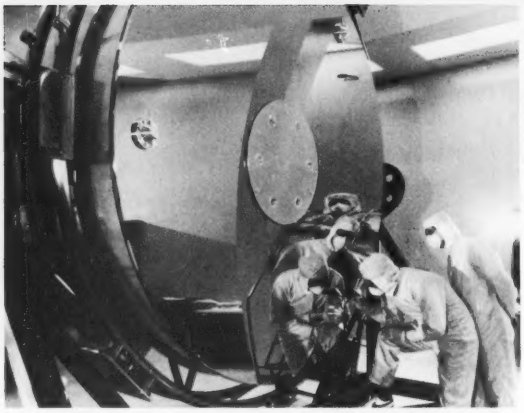
A historical project on the Space Telescope, America's newest venture in astronomy, has recently begun at the Smithsonian Institution's National Air and Space Museum, in Washington, D.C. The project, a joint effort between NASA, the museum and The Johns Hopkins University, Baltimore, Md., includes the establishment of a historical resource center which will maintain an inventory of significant documents relating to the planning, construction, design and use of the Space Telescope. A book on the background, genesis and implications of the Space Telescope project will be written by the staff of the Space Telescope Historical Project and published when the telescope is launched in 1985.

Dr. Robert W. Smith, a graduate of England's Cambridge University and a specialist in the history of astronomy, has been named historian-archivist for the project. He will compile and publish listings of selected Space Telescope documents, photographs, specifications, and drawings; survey the records of contractors involved in the development of the device, and compile a bibliography of related popular and scholarly works. Smith will also conduct taped interviews with scientists working on the Space Telescope Project and with other astronomers.

Space Telescope, to be launched from the Space Shuttle, will enable scientists to gaze over seven times farther into space than ever before, to an approximate distance of 14 billion light years. It will image astronomical bodies with at least seven times finer resolution than can be achieved by telescopes observing through the Earth's atmosphere, and will detect objects fifty times fainter than the largest ground-base



Artist concept of Space Telescope in orbit with Tracking and Data Relay Satellite, the Space Shuttle orbiter, and a ground tracking station. Space Telescope, the most powerful telescope ever built, will enable astronomers to examine celestial sources such as quasars, galaxies, gaseous nebulae, and Cepheid variable stars that are 50 times fainter than those seen by the most powerful Earth-based telescopes. Space Telescope will be remotely operated using a television-type recording system of much higher sensitivity than photographic film. This recorder is free from the limited storage range of photographic emulsion and permits very long periods of observation.



Technicians at Perkin-Elmer Corp., Danbury Conn., examine the reflective surface of the Space Telescope's primary mirror after it was coated with aluminum and magnesium fluoride. When completed, the mirror will measure 94 inches in diameter and weigh 1,800 pounds.

observatories. Space Telescope will support investigation of a wide variety of frontier problems in astrophysics.

Dr. Paul A. Hanle, chairman of the Space Science and Exploration Department at the National Air and Space Museum, and Dr. Robert Kargon, Shepard professor in the History of Science Department at The Johns Hopkins University, will direct the Space Telescope Historical Project with funding from NASA.

1983 Air and Space Bicentennial Calendar of Events

(In the December 1982 issue of NASA Activities, a calendar of events for this Bicentennial was published; the following is an updated calendar reflecting changes from the previous edition.)

January

NASA Space Shuttle Art Exhibition (special collection), Smithsonian Institution's National Air and Space Museum Washington, D.C.—through July 1983

February

Presentation to the Smithsonian Institution's National Air and Space Museum, Washington, D.C., of the Bicentennial document carried into space by the crew of the fifth Space Shuttle mission last November and the videotape of mission commander Vance Brand announcing the Bicentennial Year.

April

Arizona Aviation Week, Phoenix
National Congress of Aerospace Education, Las Vegas, Nevada
Forbes Bicentennial issue
First flight of Space Shuttle Challenger

May

New York Times Magazine Air and Space supplement
Gates Learjet Speed Run
Collier Trophy Annual Award Dinner, Washington, D.C.
May 15—John F. Kennedy Center for the Performing Arts, Washington, D.C., Air and Space Gala
Opening of the U.S. Bicentennial Pavilion at the Paris Air Show
Unveiling of space sculpture at Paris Air Show

June

Gathering of Eagles: graduation ceremony at U.S. Air Force Air Command and Staff College, Maxwell Air Force Base, Ala., featuring appearance by living legends of international aviation
Association of Naval Aviation, annual symposium, Norfolk, Va.
St. Louis/Parks College Air Exposition
Youth Museum Air Show, Beckley, W. Va.
Second flight of Space Shuttle Challenger; first U.S. woman in space

July

Chicago Museum of Science and Industry 50th Anniversary salute to manned flight
Smithsonian Institution National Air and Space Museum's Montgolfier first flight re-creation, Washington, D.C.
Dayton International Air Show and Trade Exposition
North American College Cup for Hot Air Balloons, Battle Creek, Michigan
July 31-August 6—31st Annual International Experimental Aircraft Association Convention and Sport Aviation Exhibition, Oshkosh, Wisconsin

August

New England Aero Club Air Show, Boston
Aviation Art Forum, University of Virginia, Charlottesville
First night launch of Space Shuttle; (3d flight of Space Shuttle Challenger)

September

Treaty of Paris Trophy for Ultralight Aircraft, Annapolis, Md.
Atlantic City, N.J., Air and Space Weekend
Atlantic City to Reno, Nevada, Air Race
Bicentennial Meeting of the Federation Aeronautique, Los Angeles
Business Week special section on Air and Space
International Air Races, Reno, Nevada
Westmoreland County, Pa., Air Show
Springfield, Ill., Air Rendezvous

October

U.S. Bicentennial Air Exposition, Washington, D.C.
International Balloon Rally, Albuquerque, N. Mex.
Jackson County Air Show, Pascagoula, Miss.
World premiere of film, The Right Stuff

November

International Bicentennial Gala, Washington, D.C., in cooperation with the Embassy of France to commemorate the date of the first manned flight, Nov. 21, 1783
Hollywood Salute to Air and Space

December

Wright Trophy Dinner to mark the 80th anniversary of the first airplane flight, Washington, D.C.

NASA's 25th Anniversary, Oct. 1, 1983 Historical Calendar for April

Date	Event
April 1, 1960	Launch of Tiros 1 (Beta 2)
April 2, 1959	Mercury astronauts selected
April 2, 1960	Launch of Explorer XVII
April 4, 1978	Launch of Apollo VI
April 5, 1967	Launch of Pioneer G (11)
April 6, 1965	Launch of Intelsat 1 F-1 (Early Bird 1)
April 6, 1967	Launch of ATS II
April 8, 1964	Launch of Gemini 1
April 8, 1966	Launch of Centaur Test VII (AC-8)
April 8, 1966	Launch of OAO-1
April 8, 1970	Launch of Nimbus IV (D)
April 9, 1975	Launch of GEOS-C (3)
April 10, 1982	Launch of Insat 1-A
April 11, 1970	Launch of Apollo XII
April 12, 1981	First launch of Space Shuttle Columbia
April 13, 1959	Launch of Vanguard (SLV-5)
April 13, 1974	Launch of Westar-A
April 14, 1969	Launch of Nimbus III (B2)
April 16, 1972	Launch of Apollo 16
April 17, 1967	Launch of Surveyor III (C)
April 20, 1967	Launch of ESSA V (TOS-C)
April 20, 1973	Launch of Telesat-B (Anik-2)
April 20, 1977	Launch of GEOS/ESA
April 22, 1976	Launch of NATO III A
April 22, 1970	Launch of Intelsat III F-7
April 23, 1962	Launch of Ranger IV (Mu 1)
April 24, 1971	Launch of San Marco-C (3)
April 25, 1961	Launch of Mercury (MA-3)
April 25, 1962	Saturn Test (SA-2)
April 26, 1962	Launch of Ariel 1 (Omicron 1)
April 26, 1967	Launch of San Marco II
April 26, 1978	Launch of HCMM/AEM-A
April 27, 1961	Launch of Explorer XI
April 28, 1961	Launch of Little Joe 5B
April 29, 1965	Launch of Explorer XXVII
April 30, 1979	First solar powered aircraft flight

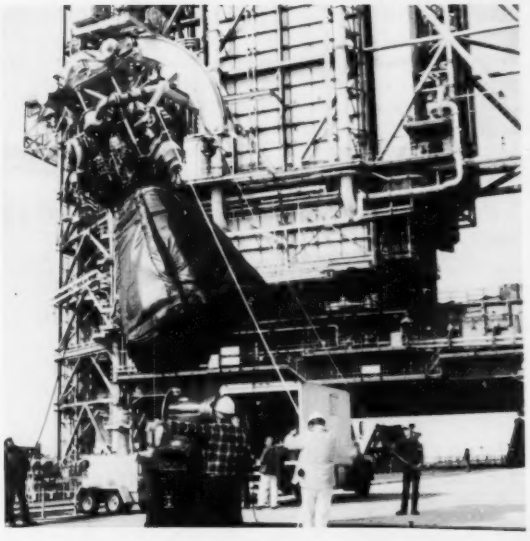
NASA Sets Up Small Business Research Office

NASA has established a Small Business Innovation Research Office to manage a new program under the Small Business Innovation Development Act of 1982 (Public Law 97-219). The program is aimed at stimulating technological innovation in the private sector and strengthening the role of small businesses in meeting NASA's research and development needs. The newly established office will be managed by F. Carl Schwenk in the Headquarters Office of Aeronautics and Space Technology.

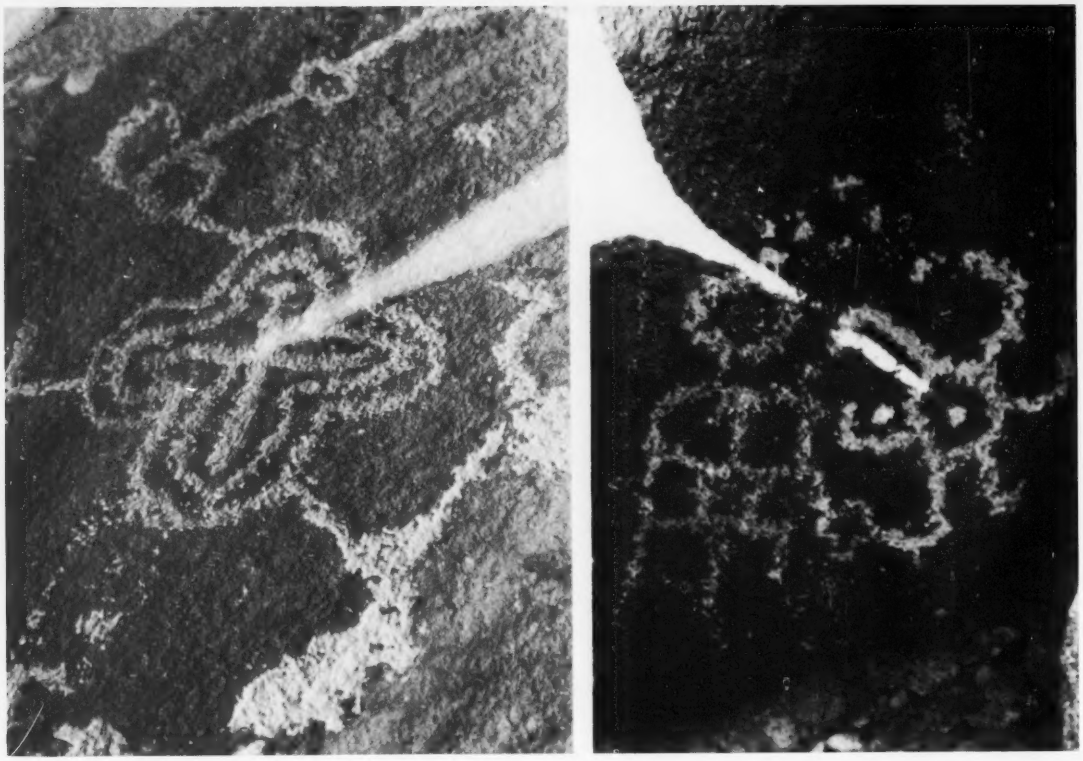
Projects funded by this program will be conducted in two phases: first, a six-month effort to explore the feasibility of business-proposed innovations and, if the first phase results warrant, a second phase to proceed further with the technological innovation. Work beyond the latter phase would be funded either by commercial firms or by specific programs of government agencies.

Proposals for Phase I will be accepted only in response to solicitations. NASA opened the first solicitation for its Small Business Innovation Research in March. In addition to instructions for submitting proposals, the solicitation contained technical topics, describing areas in which NASA believes innovations by small businesses would benefit NASA's programs and missions in aeronautics and space.

Small businesses with research and development capabilities and an interest in the NASA program can obtain additional information by writing to the Small Business Innovation Research Office, Office of Aeronautics and Space Technology, Code RB-8, NASA, Washington, D.C. 20546.



Engine Repair—Space Shuttle Main Engine 2011 is lowered away from the aft fuselage of the orbiter Challenger during its removal. A hairline crack was discovered in the combustion chamber manifold of the engine during post Flight Readiness Firing inspections. This engine was replaced by a flight-ready spare, engine number 2016. Launch of the sixth Space Shuttle mission, Challenger's maiden launch, has been scheduled for April 4.



Prehistoric Solar Markings—Photograph of solar markings made by prehistoric American Indians in Arizona. Photo at left was taken in the Anasazi Indians' Cave of Life in Arizona's petrified forest. Forty-five days before and after the winter solstice, a wedge of sunlight (marked by arrow) dies out at sunset while pointing at the center of this large outlined cross that is surrounded by fertility figures. Twenty-five different events happen in the same cave marking, in addition to the pre- and post-solstice events, the ceremonial calendar of winter solstice, summer solstice and the equinox. Photo at right shows a Hohokam Indian petroglyph site at Painted Rocks State Park, Ariz. At winter solstice, three thin pointed sunlit images cross the panel. The pointer shown here intersects the center of both circles. Summer solstice, equinox and 45 days before and after winter solstice also are marked by sunlit daggers of the petroglyphs. In all, 18 events occur at this sight. Interpretations of these solar events were developed by information on the solar petroglyph sites and can be obtained from Dr. Robert Preston, NASA Jet Propulsion Laboratory astronomer.

New Research Program to Study Ways to Reduce Helicopter Noise

Helicopter noise is the focus of a new five-year research program that will study ways to reduce greatly noise and its causes in present and future helicopter designs. The program will provide basic information to aid the development of helicopter noise prediction and reduction technologies and for noise certification criteria. It also will provide data to possibly supplement existing criteria for the location of heliports and for low-noise operational procedures.

The National Rotorcraft Noise Reduction Program will be conducted as a joint government/industrial venture by NASA's three aeronautical research centers and the industry-sponsored American Helicopter Society (AHS). The U.S. helicopter industry will supplement the $10 million NASA program with its own helicopter noise research efforts.

Noise has always been a significant concern with helicopters but it was formerly considered to be an unwanted "side effect" of the unique design considerations of these aircraft. Because of concerns about the environment, the Federal Aviation Administration (FAA) is developing practical noise standards as a requirement in future civil helicopter design.

A government and industry agreement in the form of a "Declaration of Intent" to study and reduce helicopter

noise has been reached through a Working Group on Rotorcraft Noise, composed of NASA, the AHS, the FAA and the Helicopter Association International. That agreement, signed on Jan. 21, 1983, led to establishment of the new program.

NASA's Langley, Ames and Lewis Research Centers, in Hampton, Va., Mountain View, Calif., and Cleveland respectively, will work on different aspects of the noise abatement program, aided by the AHS and four major U.S. helicopter manufacturers: Bell Helicopter Textron, Dallas/Ft. Worth; Boeing Vertol, Philadelphia; Hughes Helicopter, Culver City, Calif., and Sikorsky Aircraft, Stratford, Conn.

Government funding for the five-year project will be provided by NASA's Office of Aeronautics and Space Technology, Washington, D.C. Additional resources will be provided by the U.S. helicopter manufacturers.

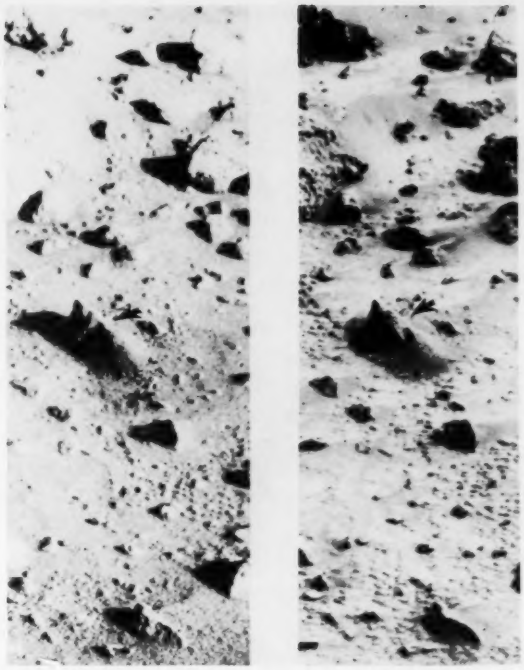
Viking Exhibit Opens at National Air and Space Museum

Images of the surface of the planet Mars transmitted from NASA's Viking spacecraft is part of a new exhibit that opened March 25 at the Smithsonian's National Air and Space Museum. "The Viking View of Mars" includes black and white as well as color images of the Martian landscape transmitted from Viking 1 and displayed on a computer terminal. The exhibit also will present information collected by Viking during the past six years on the geology and meteorology of the "red" planet.

Two Viking Landers set down on the surface of Mars in 1976, becoming the first American spacecraft to provide a close-up, in-depth look at the surface of another planet. The Landers had traveled some 460 million miles through space for nearly a year before reaching Mars.

The images seen in the Air and Space Museum's exhibit are those collected and processed by the University of Washington. From 1978 until Nov. 1982, when communication problems on the Viking 1 cut off its transmissions to Earth, the University of Washington processed the data collected by the Viking spacecraft.

The data, which included photographs, weather information and engineering information on the status of Viking's equipment, was transmitted to the university through a communications link from NASA's Jet Propulsion Laboratory in Pasadena Calif. JPL received Viking's signal via one of several antennas throughout the world that constitute the Deep Space Network.



Two photos of the Martian surface taken by the Thomas A. Mutch Memorial Station (Viking 1 lander) in the Chryse Basin in the northern hemisphere of Mars show a 5-cm (2-in.) pile of soil placed beside and partly atop an 11-cm (4-in) rock by the lander's soil-sampling arm in July 1977. The left photo was taken Feb. 1979; the right photo in July 1981. Comparison shows that some of the soil has been removed by the Martian wind to re-expose the rock.

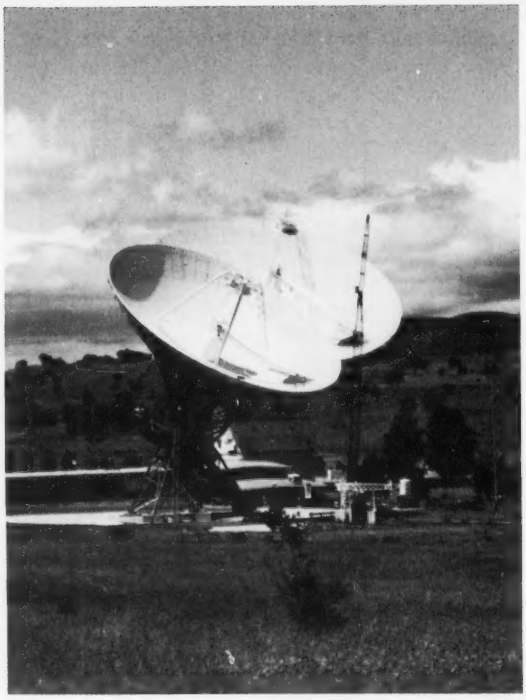
Viking Lander 1 photo of the Martian surface sharpened by an image-processing technique called interpolation. The boulder is nicknamed "Big Joe" and dust drifts near the lander are the largest features visible. Big Joe is about 2 meters (6.5 feet) across and 7 to 8 meters (23 to 26 feet) from the lander. Drifts extend from 10 to 15 meters (33 to 49 feet) across the picture. Small horizontal markings on some of the drifts indicate that the dust was deposited there some time ago and is currently being eroded away.

Other organizations and companies instrumental in the exhibit are Prime Computer, Inc., Advanced Electronics, Inc., Intel, Inc., and the Viking Fund.

"The Viking View of Mars" is located in the Exploring the Planets gallery on the second floor of the Museum, where it will remain on display indefinitely. A Viking Lander spacecraft, identical to the two that landed on the surface of Mars, is on exhibit in the Museum's Milestones of Flight gallery.

Most Distant Object in Universe Discovered

An international team of astronomers has discovered the most distant object in the universe. The astronomers from the United States, Great Britain and Australia, working through NASA's Jet Propulsion Laboratory, Pasadena, Calif., have determined that a quasar designated PKS 2000-330 is more than 12 billion light years away.



Two Deep Space Network antennas at Tidbinbilla, Australia, that were used as radio telescopes to conduct a survey allowing astronomers to pinpoint locations of a number of quasars. One quasar, PKS 2000-330, was determined to be the most distant object in the universe—more than 12 billion light years away.

Light arriving at Earth today from PKS 2000-330 began its long journey here before the solar system, and probably the Milky Way galaxy, were formed. The solar system is believed to be about 4.6 billion years old; the Milky Way is believed to have formed about 10 billion years ago.

The search that resulted in discovery of PKS 2000-330 began 10 years ago using antennas of JPL's Deep Space Network. Dr. Samuel Gulkis of JPL and Dr. David Jauncey (then at Cornell University) suggested that the Deep Space Network antennas could determine accurate positions of radio sources in the sky that might be quasars.

Gulkis and Jauncey linked the 26-meter (85-foot) and 64-meter (210-foot) antennas at the Deep Space Network's Tidbinbilla tracking station in Australia. They were joined at JPL by Australian Dr. Michael Batty, and accurately measured the positions of a large number of radio sources that had been discovered with

Space Cargo Construction—Workers at Kennedy Space Center's Launch Equipment Test Facility install keel fittings to the payload handling fixture. This device, which is modular constructed and can be air transported aboard a C-5A aircraft, will be used at contingency Shuttle landing sites around the world to unload either horizontal or vertical payloads from the cargo bay of the orbiter.

the 64-meter (210-foot) Parkes radio telescope in Australia. The team was then joined by Dr. Anne Savage, an astronomer from the Royal Observatory, Edinburgh, Scotland. Dr. Savage matched the radio sources with objects in photographs.

Dr. Bruce Peterson of the Australian National University's Mount Stromlo Observatory, together with Jauncey, Savage and Dr. Alan E. Wright, measured the spectrum of PKS 2000-330, using the 3.9-meter (12-foot) Anglo-Australian telescope.

On the night of March 25-26, 1982 the spectrum of PKS 2000-330 revealed emission lines of oxygen, hydrogen, nitrogen and carbon at a red shift of 3.78, greater than any red shift ever measured.

The quasar that had held title to most distant object before the measurements of PKS 2000-330 is 11 billion

Zero-Gravity Training—Astronaut Story Musgrave, mission specialist for the sixth Space Shuttle mission, is assisted in a suit donning and doffing exercise in the weightlessness provided by a KC-135 "zero-gravity" aircraft. These exercises are part of the training for mission specialists Story Musgrave and Donald Peterson to prepare them for their upcoming spacewalk.

light years distant. The red shift—a measure of how much a distant object shifts its light toward the red end of the spectrum—is believed to indicate the object's relative velocity away from Earth, and therefore, its distance: the greater the red shift, the greater the recessional velocity, and the greater the distance from Earth.

Quasars today present one of astronomy's greatest puzzles. They appear to be the most distant objects in the universe. They also appear to be expending vast amounts of energy—much more energy than theory can account for.

NASA's Handicapped Program

David H. Brocker, as Chief of the Systems Integration Branch at NASA's Ames Research Center in Mountain View, Calif., is responsible for the development of the flight simulation systems and research aircraft systems used by the center in accomplishing its aeronautical research mission. He holds masters degrees in electrical engineering and business administration. Brocker participates in community service activities, is a licensed private pilot and has traveled extensively for business and pleasure.

He is also NASA's Outstanding Handicapped Federal Employee for 1982—paralyzed as a result of a hunting accident at the age of 15. Brocker, who entered the Federal work force 17 years ago, is part of a growing sector within the agency—the handicapped individual.

At NASA, the primary program management responsibility for the Handicapped Program lies in NASA's Office of Equal Opportunity Programs. NASA has developed an affirmative action program for employment of handicapped individuals in the targeted disabilities (severely handicapped) which includes a detailed recruitment plan.

Recruitment activities are performed in a variety of ways: through close liaison with state vocational rehabilitation agencies; utilizing special appointing authorities; utilizing specialized recruiting efforts such as those offered by Gallaudet College and Rochester Technical Institute for the Deaf; establishing contacts under the NASA Cooperative Education Program; establishing new summer programs for handicapped individuals; ensuring that NASA's recruitment teams include recruitment of handicapped students in the visits to major colleges and universities; development of a NASA talent job bank of handicapped scientists and engineers for job referrals; placement of NASA recruitment advertisements in handicapped publications; and recruiting at national handicapped conferences.

Throughout NASA, progress continues to be made toward making reasonable accommodations and making facilities more accessible for both handicapped employees and visitors. For example: reading services and equipment are provided for the blind; a motorized wheelchair is provided for use by a paraplegic engineer; special parking spaces have been designated for handicapped employees; curb cuts have been installed for accessibility to buildings; braille elevator controls have been installed for blind employees as well as lowered controls to accommodate people in wheelchairs; restrooms have been modified; and drinking fountains have been lowered to accommodate handicapped employees.

NASA hired 21 handicapped employees in the targeted disabilities in Fiscal Year 1982, which resulted in a slight increase in their percentage in the total work force.

The agency is continuing to work toward increased hiring of handicapped individuals, increasing program awareness which includes training of NASA employees, and making its facilities more accessible to ensure that the NASA Handicapped Program becomes a vital part of the NASA community.

For further information concerning NASA's Handicapped Program, contact Lynda Sampson, Handicapped and Aged Employment Program Manager at NASA Headquarters on (202) 755-8302.

Awards Corner

Dr. John C. Houbolt, chief aeronautical scientist at NASA's Langley Research Center has received a **NASA Space Act Award** in the amount of $15,000 for his "analytical and technical contributions to the Lunar Orbit Rendezvous concept." This concept was formally adopted by NASA management in July 1962 as superior to other alternatives as a basis for an orbital technique to achieve manned lunar landings. The feasibility of this concept was proven by six successful manned lunar landings during the period July 1969 to December 1972.

Under section 306 of the National Aeronautics and Space Act of 1958, the NASA Administrator is "authorized . . . to make a monetary award, in such amount and upon such terms as he shall determine to be warranted, to any person for any scientific or technical contribution to the Administration which is determined . . . to have significant value in the conduct of aeronautical and space activities. NASA Space Act Awards can also be granted for the filing of a U.S. patent application, or for publishing a NASA technical

brief. Nominations for this award are sent to the Inventions and Contributions Board at NASA Headquarters who in turn evaluates the applications and makes recommendations of monetary amount to the Administrator. The Administrator can approve amounts of $100,000 or less; awards of more than $100,000 must be submitted to the appropriate Congressional committees for approval.

Tom McMurtry, chief test pilot for NASA's Dryden Flight Research Facility, has received the **Ivan C. Kincheloe Award** for his flight research work on NASA's AD-1 oblique wing aircraft, on which he is project pilot. The Kincheloe Award is presented each year by the Society of Experimental Test Pilots to the test pilot considered to be at the top of the profession. It is the most highly esteemed award a pilot can win. The Society of Experimental Test Pilots presents the award in memory of Captain Ivan C. Kincheloe, an Air Force test pilot who died when his plane crashed in a test flight accident. It is conferred for outstanding professional accomplishments in the conduct of flight testing within the immediate past year.

Aaron Cohen, Director of Engineering and Development at NASA's Johnson Space Center, has been selected to receive the **Engineer of the Year Award** sponsored by the National Society of Professional Engineers. This program recognizes the contributions of an engineer in the federal government. Cohen was cited for his "significant technical contributions to the advancement of manned spaceflight." His citation further read that he "more than any other single individual is responsible for the programmatic and engineering achievements of the Space Shuttle Orbiter project."

Luat T. Nguyen, aerospace technologist at NASA's Langley Research Center, has received the **Lawrence Sperry Award for 1983,** presented by the American Institute for Aeronautics and Astronautics. This award is presented for a notable contribution made by a young person to the advancement of aeronautics or astronautics. Nguyen was cited for his "development of control system concepts that have become widely accepted and used in current generation fighter aircraft for improving maneuverability and departure/spin resistence. The Lawrence Sperry Award is named in memory of a pioneer aviator and inventor who died while attempting a flight across the English Channel on Dec. 13, 1923.

What's New in NASA's Television and Radio Programming

Programs released in March (running through April 1):

Television:

Aeronautics and Space Report (4½ minutes)
Shuttle Thermal Protection

Radio:

Intergalactic Clouds, Pulsars, Quasars, and other Celestial Things (14½-minute monthly report; featuring Dr. Yervant Terzian, Cornell University, and Dr. Donald Campbell, Arecibo Observatory, Puerto Rico)

Search and Rescue Satellite System (4½-minute weekly report; featuring Ken Pedersen, NASA Headquarters)

Looking into the Infrared Sky (4½-minute weekly report; featuring Donald Wrublik, NASA Headquarters and Dr. Michael Werner, Ames Research Center)

Shuttle Thermal Protection System (4½-minute weekly report; featuring Howard Goldstein, Ames Research Center)

Space Shuttle Challenger's First Flight (4½-minute weekly report; featuring astronauts Weitz, Peterson, and Musgrave)

Space Notes (1 minute each):
Challenger's Maiden Flight
Revolution in Communications
Watching the Birth and Death of Stars
Baffling Discovery by Arecibo Telescope
Shuttle Imaging Radar
Most Distant Object in Universe Discovered
International Sun-Earth Explorer
Satellite Images Reveal New Ocean Features
Detecting Minerals from Space
Spacelab

Copies of television tapes are sent simultaneously to all NASA Visitor Information Centers and Public Affairs Offices, and to 650 television stations nationwide as well as to 425 cable television systems via the satellite SATCOM III. Five hundred television stations receive material formatted as a 4½-minute program; the remaining 150 stations receive a 90-second "spot"—a condensed version of the 4½-minute presentation.

Copies of NASA radio tapes listed in this column are available upon request from your local NASA Public Affairs Office or by phoning Ivelisse Rodriguez at (202) 755-8354; FTS 755-8354; or by mailing your request to her at the following address: NASA Headquarters, Public Affairs Division, Mail Code LFD-8, Room 6102, Washington, D.C. 20546. Rodriguez welcomes your ideas or suggestions for future topics.

Contractor News

NASA's Lewis Research Center, Cleveland, Ohio, has released a request for proposal for the design, development, building and launch of the Advanced Communications Technology Satellite (ACTS). The request for proposal is an invitation to communications satellite builders to bid on the ACTS system which will consist of a flight spacecraft, ground system and operations. It is anticipated that a contract will be awarded in December 1983. The ACTS is scheduled for launch by the Space Shuttle in 1988 and would be used for communications experiments for several years.

Technologies to be developed under the ACTS program include:

- new multibeam antenna on the satellite capable of transmitting signals to and receiving signals from small areas on Earth of approximately 150 mile diameter;
- on-board computer that receives signals transmitted from ground stations; then sorts, groups and stores them temporarily in its memory banks according to their destinations and schedules their transmissions to the appropriate ground terminals at the proper time and on the appropriate spot beam;
- on-board switch that will route high data rate message traffic over fixed spot beams to major communication centers.

Snow Crystals in Space—Jun Tanaii, Nippon Electric Co., recharges batteries for the Japanese-sponsored Getaway Special which is scheduled to be flown on the sixth Space Shuttle mission in March. To his left is Shigeru Kimurs, manager of the Analysis and Research Center of the Asahi Shimbun, one of the largest newspapers in Japan, sponsor of the experiment. The Getaway Special is designed to manufacture artificial snow crystals under the weightless conditions of space.

Curtiss-Wright Corp., Woodridge, N.J., has been awarded a $2.5 million contract by NASA's Lewis Research Center, Cleveland, for design, fabrication, assembly and acceptance testing of an experimental single-rotor rotary engine test rig. The test rig is to consist of a stratified charge engine, turbo-charger, controlled direct injected fuel system and appropriate support hardware. The testing will serve to establish feasibility for future light aircraft use of such a rotary powerplant. Specifications for the engine are that it be designed for maximum strength, structural durability and trouble-free mechanical operation consistent with research needs. Unlike piston-type engines which power most light aircraft, a stratified charge rotary can operate on lower grade, less expensive and more readily produced fuels such as jet engine fuel and diesel fuel. The cost-plus-fixed-fee contract began Dec. 29, 1982 and will extend for 26 months, ending in February 1985.

NASA and **GTI Corp.,** San Diego, Calif., have determined mutually not to continue past Phase One of a year-old joint endeavor involving low-gravity metallurgical research experiments in space. The Joint Endeavor Agreement, signed Jan. 20, 1982, was a cooperative, no-exchange-of-funds arrangement in which each party contributed certain of its resources to achieve commercial and scientific goals of mutual interest. Under the agreement, the first of its kind between NASA and a non-aerospace company, GTI investigated, during Phase One, the technological and commercial feasibility of a business to rent facilities for low-gravity metal alloy resolidification experiments aboard the NASA Space Shuttle.

Analyzing the results of the Phase One Study, which demonstrated definite technological feasibility, GTI concluded that there is currently not a sufficient customer market to support a viable commercial enterprise. As a result, GTI and NASA have decided not to proceed into Phase Two and Phase Three. Phase Two and Phase Three were intended, respectively, to implement a space-rated furnace system and subsequently, to perform the low-gravity experiments during the Space Shuttle flights beginning in 1984.

Martin Marietta Aerospace, Michoud Operations, New Orleans, La., has been awarded a $7 million contract extension by NASA's Kennedy Space Center, Fla., for engineering services for the processing of the external tank and its related ground systems equipment at Vandenberg Air Force Base, Calif. The company also will develop plans for the entire cryogenic storage transfer system used in the Shuttle and for site activation of the ground systems facilities. The

cost-plus-award-fee contract covers the period from March 1, 1983 through Sept. 30, 1984, and brings the total value of the contract to $7.1 million.

Honeywell's Electro-Optics Division, Lexington, Mass., has been awarded a $300,000 contract by NASA to evaluate a two-dimensional infrared detector array for use in space astronomy. Under terms of the contract, Honeywell will fabricate a "mosaic" focal plane array of 4,096 mercury cadmium telluride detector elements mounted on a silicon charge-coupled device. Honeywell will then conduct experiments to evaluate performance of the array in low-operating temperatures and low levels of light. This is the first commercial use of mercury cadmium telluride material. Imaging capabilities of space instruments currently using discrete infrared detectors could be significantly expanded with two-dimensional arrays and detector arrays of this type can ultimately be used in instruments flown on the Space Shuttle or in refurbishment of the Space Telescope.

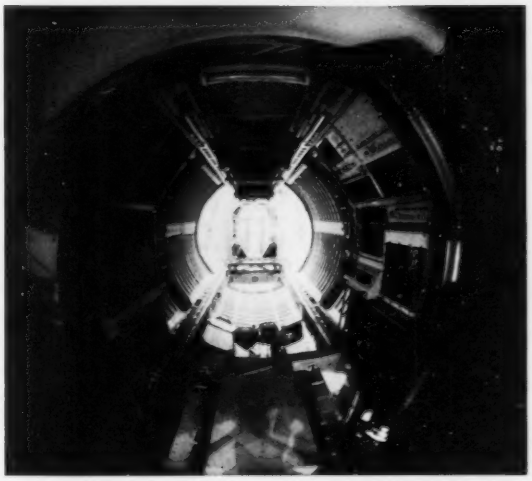
Martin Marietta Aerospace, Denver, Colo., has been selected by NASA's Marshall Space Flight Center, Huntsville, Ala., for negotiation leading to a contract for detailed engineering analyses and selected advanced development evaluations of a tethered satellite system concept. The approximate value of the contract will be $1 million. Negotiations for the contract will result in Martin Marietta performing an advanced development phase which entails more detailed engineering analyses and advanced development testing of the system plus testing of some key components similar to those to be flown in space.

A firm option also will be negotiated for the design and development phase, which is full-scale development of the system. Sometimes called a "new start," this final phase has not yet been approved. It will not proceed unless NASA Headquarters, the Office of Management and Budget and the Congress approve it through the usual new start process, and the Marshall Center subsequently exercises the government's option to go forward with development. NASA has discussed the possibility of developing the tethered satellite system jointly with Italy. NASA would build the deployment system (the reel and related appartus that would fit in the Shuttle orbiter's cargo bay) and Italy would build the satellite itself. NASA would be responsible for systems integration and mission operations.

If approved for final development, the tethered satellite system would be carried into orbit by the Space Shuttle in the late 1980s. There the satellite would be suspended downward from the cargo bay on a tether up to 60 miles long, and would troll the Earth's upper atmosphere for magnetospheric, atmospheric and gravitational data. The satellite could also be deployed upward to study electrodynamics and other scientific phenomena. Currently there are limited means by which the upper atmosphere—around 60 to 90 miles up—can be studied. The area is too high for airplanes to reach and too low for satellites to remain in orbit for long.

A number of instrument-laden rockets have been used with some limited success, but these pass through the upper atmosphere for only a few minutes before falling back to Earth. The tethered satellite system, however, could study the upper atmosphere on a global basis for days at a time.

The U.S./Italian agreement for the current study phase evolved from an initiative in 1980 by the Italian government's PSN/CNR (Italian National Space Plan/National Research Council) to NASA for possible collaboration on the tethered satellite system which NASA has been studying since the mid-1970s. In 1981 a Letter of Agreement was signed by NASA and PSN/CNR which established the tasks each agency agreed to undertake during the study phase. The agreement also provided for a science working group, co-chaired by NASA and PSN/CNR, to provide science requirements and to develop and recommend the scientific objectives for the Tethered Satellite System.



Spacelab Shell—Unusual view of Spacelab's protective shell. Soon the laboratory's experiment rack, destined for the inner reaches of outer space will be inserted into this shell. Launch of Spacelab 1 aboard Space Shuttle Columbia is scheduled for flight nine in September.

Best Wrecking Co., Detroit Mich., has been awarded a $574,601 fixed-price contract by NASA's Kennedy Space Center, Fla., for disassembling the last remaining Saturn V/Apollo launch umbilical tower. The 122-meter (400-foot) tall tower sits atop a Saturn V/Apollo Mobile Launcher which is to be modified to serve as a Mobile Launcher Platform for the Space Shuttle program. Under terms of the contract, which covers the period from Feb. 24, through Dec. 1, 1983, Best Wrecking is to develop two options: one is to disassemble the tower and preserve sections in a storage site at Kennedy. The other is for disassembly with the steel used for scrap. Decision on the options may be made within 60 days of contract award.

Shuttle Seven Crew—Four-fifths of the crew members of the seventh Space Shuttle mission scheduled for launch in June at a recent trip to Kennedy Space Center for a Shuttle Interface test. From left to right are: Sally K. Ride, mission specialist; John Fabian, mission specialist; pilot, Rick Hauck; and commander, Bob Crippen. Not pictured is Dr. Norman Thagard, mission specialist, who will be aboard Challenger's second flight to observe the effects of weightlessness and study the cause of motion sickness in astronauts.

Space Shuttle Launches for 1983

Orbiter	Launch Date	Launch Number	Launch Site	Payload
Challenger (OV-099)	April 4	6	KSC	TDRS-A
Challenger (OV-099)	June	7	KSC	OSTA 2; SPAS-01 Telesat-F; Palapa B-1
Challenger (OV-099)	August	8	KSC	INSAT 1-B; TDRS-B
Columbia (OV-102)	September 30	9	KSC	Spacelab 1
Challenger (OV-099)	December 14	10	KSC	DOD 84-1

Patents for Inventions from NASA Research

The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent and Trademark Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel of the indicated installation.

Inventor(s) & Employers	Title	Patent No.	Installation
James F. Morris, NASA/LeRC	Heat pipes containing alkali metal working fluid	4,372,377	LeRC
Richard R. Adams, Ian O. Macconochie, and Bordie D. Poole, Jr., NASA/LaRC	Miniature spectrally selective dosimeter	4,372,680	LaRC
Carvin Schomburg and Robert L. Dotts, NASA/JSC	High temperature silicon carbide impregnated insulating fabrics	4,373,003	JSC
William A. Mueller, John D. Ingham, and William W. Reilly, Caltech/JPL	Elastomer-coated fillers and composites thereof	4,373,039	NRO/JPL
Alan C. Seabaugh and Robert J. Mattauch, Caltech/JPL	Controlled in-situ etch-back	4,373,989	NRO/JPL
Daniel L. Deadmore and Stanley G. Young, NASA/LeRC	Silicon-slurry/aluminide coating	4,374,183	LeRC
Robert D. Lee, NASA/ARC	Scanning seismic intrusion detection method and apparatus	4,374,378	ARC
George H. Nichols, NASA/DFRF	Aircraft canopy lock	4,375,281	DFRF
Gordon Green, Robert J. Mattauch, Caltech/JPL	Thin wire pointing method	4,375,396	NRO/JPL
Paul M. Hergenrother, VPI, Blacksburg, Va.	Polyphenylquinoxalines containing pendant phenylethynyl and ethynyl groups	4,375,536	LaRC
William E. Thornton, NASA/JSC	Kinesimetric method and apparatus	4,375,674	JSC

Expendable Launches for 1983

Name	Launch Date	Vehicle	Range	Mission Remarks
*IRAS	January 25	Delta	WSMC	Infrared astronomy. NASA scientific.
NOAA-E	March 28	Atlas-F	WSMC	NOAA weather and SARSAT. Reimbursable.
Intelsat V-F	April 7	Atlas Centaur	ESMC	Intelsat communications. Reimbursable.
RCA-F	April 8	Delta	ESMC	RCA communications. Reimbursable.
NAVY-21	2d quarter	Scout	WSMC	DOD transit. Reimbursable. Call up.
GOES-F	April 28	Delta	ESMC	NOAA weather. Reimbursable.
EXOSAT	May 26	Delta	WSMC	European Space Agency. Reimbursable.
Galaxy-A	June 9	Delta	ESMC	Hughes Communications, Inc. Reimbursable.
HILAT	June	Scout	WSMC	Air Force research and development. Reimbursable.
Telstar-3A	July 28	Delta	ESMC	AT & T communications. Reimbursable.
San Marcos D/L	July	Scout	SMR	International cooperative/Italy.
RCA-G	August 25	Delta	ESMC	RCA communications. Reimbursable.
AF-1	August	Scout	WFC	Air Force development program. Reimbursable.
NOAA-D	August	Atlas-F	WSMC	NOAA weather. Reimbursable.
Galaxy-B	September 22	Delta	ESMC	Hughes Communications, Inc. Reimbursable.
NATO-IIID	October 27	Delta	ESMC	NATO communications. Reimbursable.
NAVY-22	4th quarter	Scout	WSMC	DOD transit. Reimbursable. Call up.
Intelsat VA-A	December	Atlas Centaur	ESMC	Intelsat communications. Reimbursable.

* Successful launch

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

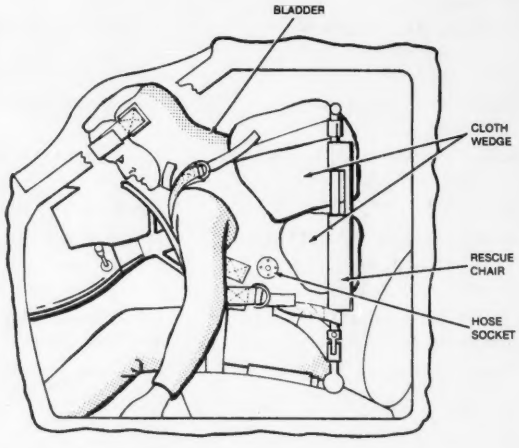
Spine Immobilizer for Accident Victims

The risk of spinal cord injury is high for anyone involved in a serious vehicle accident. In an effort to prevent this type of injury, an accident victim should be rapidly immobilized and restrained to permit safe removal of the victim from the accident scene within a short time after help arrives.

A new device invented by Hubert C. Vyukal of NASA's Ames Research Center, Mountain View, Calif., and Kenneth Lamson of Kenneth Lamson and Associates,* provides this critical back support in a safe, efficient manner, significantly reducing the risk of spinal injury and improving upon other methods of restraint and support such as a spine board or articulated chair. Use of these other methods has resulted in additional injury while the victim is being fastened to the back support. In this method, makeshift pads are placed between the victim and the board or chair; often the pads create undesirable pressure points on the victim.

This new immobilizer device is a bladder made of resilient plastic which is strapped about the head and torso of the victim (see figure). The victim is secured with a pair of straps that cross one another over the chest above the stomach region and another pair of straps that engage the lower portion of the torso beneath the stomach region so that this region is kept free of any restraining forces.

Once the straps are adjusted, a hose is plugged into a socket on the bladder and air is withdrawn by a pump. When the air is withdrawn, the tightly compressed microballoons that fill the bladder become as firm as concrete and rigidly support the victim's spine.



An adjustment valve controls the air evacuation rate; in this way a paramedic can reversibly soften and harden the microballoons and the conformal blanket formed by the bladder to best fit the victim.

The rigidified bladder is then secured to a support and the victim is transported from the accident scene using this support. When the victim has reached the hospital, a valve is opened to admit air to the bladder to soften or relax the rigid support. A filter within the flexible bladder filters air and prevents the microballoons from escaping.

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* NASA does not endorse commercial products as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.

NASA
National Aeronautics and Space Administration